TAUNTON RIVER BASIN
EASTON, MASSACHUSETTS

LONGWATER POND DAM
MA 00171

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

APRIL 1979

UNCLASSIFIED

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Longwater Pond Dam is a 200 foot long, 10 foot high earth dam. The dam is in fair condition. The dam has been classified as "small" and in the "low" hazard category. A test flood equal to the 100 year frequency flood was used for this analysis.

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LONGWATER POND DAM

MA 00171

TAUNTON RIVER BASIN
EASTON, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION
PROGRAM

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PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

Identification No.: MA00171

Name of Dam: Longwater Pond Dam

Town: Easton

County and State: Bristol County, Massachusetts

Stream: Tributary of Taunton River

Date of Inspection: December 8, 1978

Longwater Pond Dam is a 200-foot long, 10-foot high earth dam. The upstream face of the dam is a vertical concrete wall with earth fill at the toe, and the downstream face is a vertical stone masonry wall. The crest of the dam which is Main Street in Easton, is 44 feet wide. The outlet works consist of a central outlet plus a side channel spillway located to the right of the outlet. The intake to the central outlet is 7 feet by 7.5 feet and controlled by a dual set of stoplogs. The crest of the side channel spillway is 1 foot wide, 85 feet long and at elevation (El) 115.4 feet. The spillway is 6 feet wide and the spillway channel invert varies from El 114.6 at the right abutment to El 113.2 at the discharge to the box culvert. Flow from both outlets combines in a highway culvert which extends under Main Street. Flow from the culvert discharges into a natural 20-foot wide streambed.

There are deficiencies which must be corrected to assure the continued performance of this dam. This conclusion is based upon the visual inspection at the site, the available engineering data, and limited evidence of operational and maintenance procedures. Generally, the dam is in fair condition. At the time of the inspection, the stoplogs had been removed and the pond drained.

The following signs of distress were noted at the site: absence of riprap on the upstream slope of the dam below the concrete wall; uncompacted earth fill

adjacent to the left abutment of the outlet; scoured and eroded concrete on the outlet works; and spalling on the crest of the side channel spillway; cracking and local depressions in the pavement on the crest of the dam. The stoplogs were replaced shortly after the inspection, and the pond level returned to a higher elevation. At a second visit to the site, seepage was noted through the crest of the spillway. For the purpose of the hydraulic computations, the upper elevation of the stoplogs is assumed to be 114.0.

Based on Corps of Engineers guidlines, the dam has been classified as "small" and in the "low" hazard category. Accordingly, a test flood equal to the 100-year frequency flood was used for this analysis. Hydraulic analyses indicate that the central outlet with stoplogs can discharge a flow of 900 cfs with the water surface at El 118.5 (the low point on the crest of the dam). Therefore, an outflow test flood (one-quarter the PMF) of 1,790 cfs at pond El 122.2 will overtop the dam by 3.7 feet. The spillway can discharge 50 percent of the test flood.

It is recommended that the owner accomplish the following: place riprap at the toe of the upstream wall; compact earth fill adjacent to the central outlet; repair concrete on the outlet and spillway; repair seepage area on the crest of the side channel spillway; and repair asphalt paved crest. The Owner should also implement a systematic program of inspection and maintenance.

The recommendations and remedial measures outlined above and in Section 7 should be implemented by the Owner within a period of one year after receipt of this Phase I Inspection Report.

Edward M. Greco, P.E.
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Connecticut Registration
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Approved by:

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No. 19703

PREFACE

This report is prepared under guidance contained in Recommended Guidelines for Safety Inspection of Dams, for a Phase I Investigation. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general conditions and the downstream damage potential.

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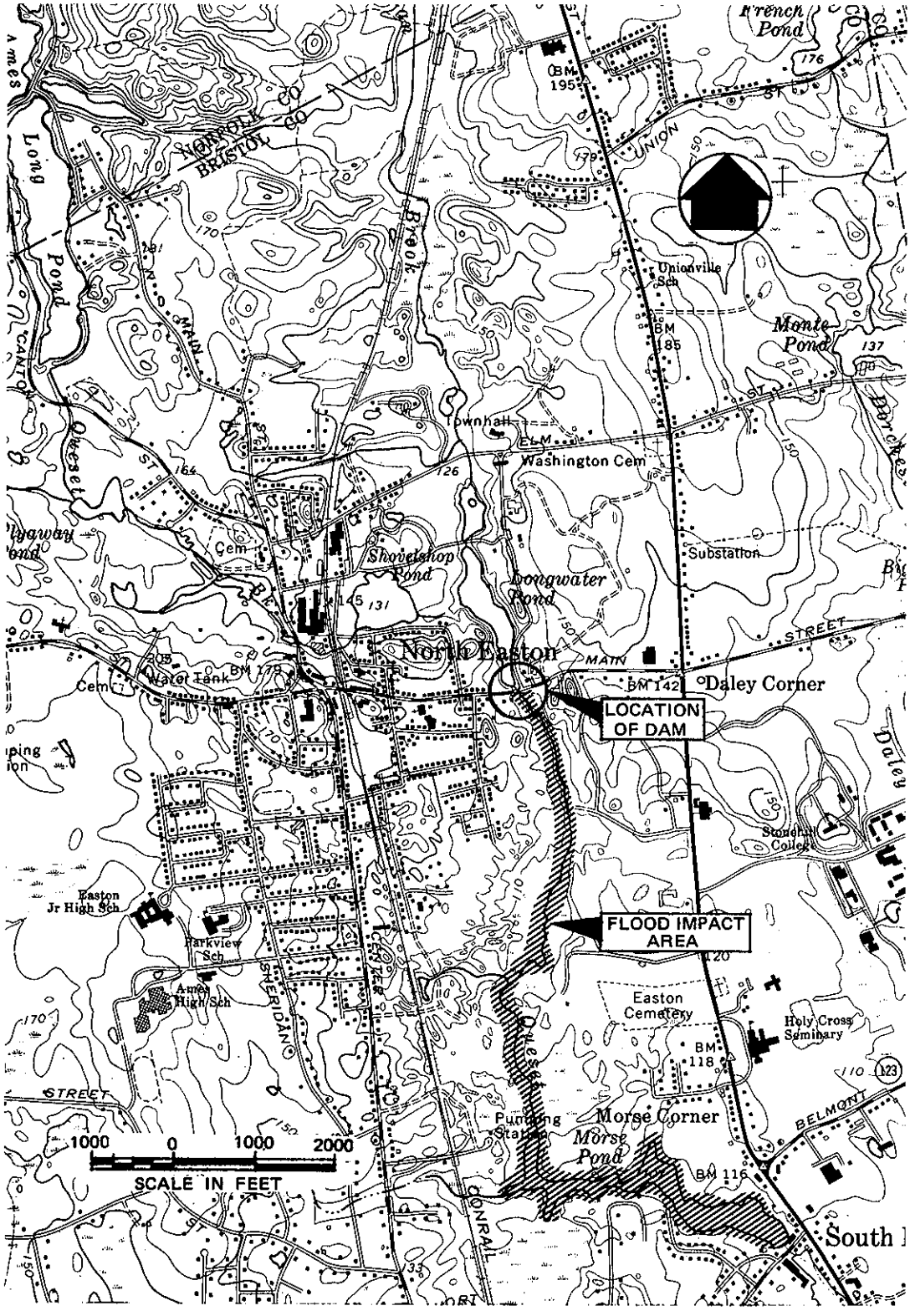
EASTON, MASSACHUSETTS



LOCATION MAP – LONGWATER POND DAM

NATIONAL DAM INSPECTION
PROGRAM

PHASE I INSPECTION REPORT

LONGWATER POND DAM

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, dated August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Divison of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Metcalf & Eddy, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Contract No. DACW 33-79-C-0016, dated November 28, 1978, has been assigned by the Corps of Engineers for this work.

b. Purpose:

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and assist the States to quickly initiate effective dam safety programs for non-Federal dams.

(3) Update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location. The dam is located on Queset Brook a tributary of the Hockomock River, in the Town of North Easton, Bristol County, Massachusetts (see location map.)

b. Description of Dam and Appurtenances. Longwater Pond Dam is an earthfill dam, 200-feet long and 10-feet high. The crest of the dam, which is also Main Street, is 44-feet wide and paved with asphalt. (See Figure B-1). The elevation of the crest varies from 118.5 to 119.2. There are sidewalks, curbs and gutters on each side of the pavement. The downstream side of the crest consists of a stone masonry wall approximately 3 feet high. The stone wall abuts each end of the 22-foot long concrete wall which is directly over the spillway discharge box culvert. A 2-1/2-foot high iron pipe guard rail is located on the upstream side of the crest.

The downstream face of the dam is a vertical stone masonry wall. The upstream face of the dam, to the left of the outlet, consists of uncompacted earthfill which was apparently dumped in place. The slope varies from 1:1 to 5:1, horizontal to vertical. The right upstream slope consists of a concrete side channel spillway. The dam ties into natural grade at both abutments.

The approach to the central outlet structure and side channel spillway has no training walls. The floor of the approach channel slopes gently toward the outlet. During recent dredging operations, a temporary earth dike was constructed in the pond, just upstream of the outlet structure. At very low pond levels, water would either be diverted around the dike or flow through the dike to the outlet, through a corrugated metal pipe. At high pond levels the low dike and pipe are submerged.

The outlet works for Longwater Pond is a combination of a side channel spillway and a

central outlet, both constructed of concrete. The side channel spillway is located on the upstream face of the dam to the right of the outlet.

The crest of the concrete spillway is one foot wide, 85 feet long and at El 115.4. The discharge channel behind the crest is 6 feet wide and varies from 0.8 feet deep (El 114.6) at the far right end to 2.2 feet (El 113.2) deep at the outlet structure. (See Figure B-2). The side channel spillway drops 3.6 feet into the main discharge channel of the outlet structure. The central outlet consists of a rectangular structure, 7 feet by 7.5 feet, divided into two bays by a center wall which supports two sets of stoplogs. The bays are 3.0 and 3.1 feet wide. The top of the outlet structure is covered by an iron grate.

At the time of the inspection, all stoplogs had been removed and the water level in the pond was at El 109.6. When a second visit was made to the site on January 29, 1979, the stoplogs had been replaced. The water level at this time was at El 114.7. Water was flowing over the top of the stoplogs, but not over the crest of the side channel spillway.

Pond elevations above 117.2 will cause additional discharge to the culvert to occur through the grating covering the outlet.

Discharge from the combined spillway and outlet flows in a 7 by 7.5 foot box culvert under Main Street. The culvert is approximately 45 feet long, and constructed of concrete and stone masonry. Water flowing through the culvert discharges into a narrow stream channel with a natural bed of sand and gravel.

c. Size Classification. Longwater Pond Dam is classified in the small category since it has a maximum height of 10 feet and a maximum storage capacity of 90 acre-feet.

d. Hazard Classification. The area downstream of the dam is a long reach of gently rolling meadow and pastureland. Below this area, Queset Brook flows through wood and swampland to Morse Pond, about one mile downstream of the dam. In the event of complete failure of the dam, the floodplain and associated swamps of Queset Brook and Morse Pond would probably attenuate the flood flows (see Location Map). Extensive property damage or any loss of life is unlikely, since the land is only sparsely developed. Accordingly, the dam is placed in the low hazard category.

e. Ownership. The dam is owned jointly by the Town of Easton, Massachusetts (Telephone 617-238-1091) and by Mr. Oliver Ames, 295 Lee Street, Brookline, Massachusetts 02146 (Telephone 617-482-5270).

f. Operators. The dam is operated by personnel from the Town of Easton Engineering Department, in conjunction with Mr. Oliver Ames.

g. Purpose of Dam. The dam and pond were formerly used for storage for power. The present purpose of the pond is solely recreational and aesthetic. The dam also serves as the embankment for Main Street (Route 123) in North Easton.

h. Design and Construction History. There are no records concerning the design and construction history for this dam.

i. Normal Operating Procedures. Normal operating procedure is to leave the stoplogs in place to maintain a high water level in the pond. During periods of heavy rainfall or potential flooding from upstream dams and ponds, the owner reportedly removes the stoplogs and lowers the water level.

1.3 Pertinent Data

a. Drainage Area. The approximately 5,443 acre (8.5 square mile) drainage area includes the drainage areas of several ponds located northeast and northwest of the dam (see Figure D-1).

Longwater Pond lies in the valley of Whitman Brook, which flows from the north, and Queset Brook, which flows from the west. The drainage area is moderately developed, wooded, and gently rolling. The shoreline of Longwater Pond is undeveloped.

b. Discharge. At the time of the inspection the stoplogs at the outlet works had been temporarily removed. Under normal conditions, flow through the outlet commences at water surface El 114.0, which is approximately the top of the stoplogs. Flow over the side channel spillway would occur at El 115.4.

Water from both the spillway and outlet works discharges into a 7.0 by 7.5 foot box culvert through the dam (under Main Street). Below Main Street the discharge flows into a natural stream. The stream bed is approximately 20 feet wide, and slopes at about 1 percent.

The outlet with stoplogs can discharge 900 cfs with the water surface at El 118.5 which is the low point on the crest of the dam. The outflow test flood (one-quarter PMF) is 1,790 cfs at water surface El 122.2. The flood will overtop the dam by 3.7 feet.

The maximum flood level at this dam is unknown. The dam was overtopped in 1968 when the dam upstream at Flyway Pond failed.

c. Elevation (Feet Above Mean Sea Level (MSL)). A benchmark was established at El 117.2 on the top of the right upstream corner of the outlet works. (See Figure B-1 for the location).

(1) Top dam: 118.5 to 119.2

(2) Test flood pool: 122.2

(3) Design surcharge: Unknown

(4) Full flood control pool: Not applicable

(5) Recreation pool: 114.0

(6) Spillway crest: top of stoplogs - 114.7
bottom of stoplogs - 108.8
side channel spillway - 115.4

(7) Upstream portal invert diversion tunnel: N/A

(8) Stream bed at centerline of dam: 107.9

(9) Maximum tailwater: N/A

d. Reservoir.

(1) Length of maximum pool: 2,000 feet

(2) Length of recreation pool: 2,000 feet

(3) Length of flood control pool: N/A

e. Storage (acre-feet)

(1) Test flood surcharge: 115

(2) Top of dam: 90

(3) Flood control pool: N/A

(4) Recreation pool: 28

(5) Spillway crest: 28

f. Reservoir Surface (acres)

(1) Top dam: 13.8

(2) Test flood pool: 13.8

(3) Flood control pool: N/A

(4) Recreation pool: 13.8

(5) Spillway crest: 13.8

g. Dam.

(1) Type: Earthfill

(2) Length: 200 feet

(3) Height: 10 feet

(4) Top width: 44 feet

(5) Side slopes: Vertical

(6) Zoning: Unknown

(7) Impervious core: Unknown

(8) Cutoff: Unknown

(9) Grout curtain: Unknown

i. Spillway.

(1) Type: Sharp crested

(2) Length of weir: outlet (stoplogs) - 7.5 feet
side channel - 85 feet

(3) Crest elevation: outlet (with stoplogs) - 114.7
side channel spillway - 115.4

(4) Gates: None

(5) Upstream channel: No approach channel; pond bottom is pervious material - sand and gravel, recontoured by recent excavation

(6) Downstream channel: Gently sloping, natural meandering stream below culvert under Main Street.

j. Regulating Outlets. The regulating outlet at the dam is the concrete outlet structure which extends into the pond. The invert of the outlet is at El 108.9. Two sets of stoplogs are keyed into the outlet on either side of a central concrete wall. Flow through the outlet is controlled by adjusting the position of the stoplogs. At the time of the inspection the

stoplogs had been removed temporarily. At a later visit, the stoplogs were in place, with the top elevation estimated at 114.7 MSL.

With one foot of stoplogs removed from the outlet, it would take 16.7 hours to lower the pond level from El 114.0 to 113.0.

SECTION 2

ENGINEERING DATA

2.1 General. No plans, specifications or computations are available from the Owner, State or county relative to the design, construction or repair of this dam. Repairs were made in 1973-1974 to the concrete stone masonry walls in the vicinity of the central outlet and culvert, and the side channel spillway. These repairs were recommended in the Bristol County inspection report dated November 8, 1973.

We acknowledge the assistance and cooperation of personnel of the Massachusetts Department of Public Works; the Massachusetts Department of Environmental Quality Engineering, Division of Waterways; and The Engineer for the Town of Easton.

In addition, we acknowledge the assistance and cooperation of the Owner, Mr. Oliver Ames, 295 Lee Street, Brookline, Massachusetts who provided information on the operation and past performance of the dam.

2.2 Construction Records. There are no construction or as-built drawings for the dam, spillway or outlet structure.

2.3 Operating Records. There are no operating records available for this dam.

2.4 Evaluation

a. Availability. There is limited engineering data available.

b. Adequacy. The lack of detailed hydraulic, structural, and construction data did not allow for a definitive review. Therefore, the evaluation of the adequacy of this dam is based on review of available drawings, visual inspection, past performance history, and engineering judgment.

c. Validity. Comparison of the limited information available from the Owners with the field survey conducted during the Phase I Inspection indicates that the information is valid.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. The Phase I Inspection of the dam at Longwater Pond was performed on December 8, 1978. A second visit was made to the site on January 29, 1979. By this time the stoplogs had been replaced, and the pond was filled. A copy of the inspection check list is included in Appendix A. Previous inspections of this dam were made in 1959 by Hayden, Harding and Buchanon, Inc., in 1970 by Universal Engineering Corporation and in 1973 and 1978 by the Massachusetts Department of Public Works. A copy of each report is included in Appendix B.

b. Dam. Longwater Pond Dam is an earthfill dam with an asphalt paved roadway (Main Street) on the crest. The dam is generally in fair condition. No seepage through the embankment was observed, however, there were other signs of distress at the site. There is no riprap on the upstream slope of the embankment at the base of the concrete wall, and some erosion is visible at the upstream face of the right abutment. At the left abutment (to the left of the outlet works), the upstream slope has been covered with uncompacted earthfill. There are already signs of erosion in this area, and more is likely to occur unless the bank is properly compacted and protected with riprap.

The downstream face of the dam is in good condition. Surface cracks and local depressions are visible on the paved crest of the dam. This should be repaired to prevent further deterioration of the crest and upper slopes.

c. Appurtenant Structures. The outlet works for the pond consist of a central outlet with stoplogs, and a side channel spillway. The inlet

to the central outlet is 7 feet high and 7.5 feet wide. A center concrete wall divides the outlet into two bays. This wall, and the outer side walls, support the two sets of stoplogs. The concrete at the base of the side walls and center wall is eroded, and spalling of the concrete was noted elsewhere.

The side channel spillway is constructed of concrete along the upstream slope of the right embankment. Water is seeping through the concrete crest of the spillway, near the discharge end of the trough. The seepage area is a horizontal zone of spalled and eroded concrete, approximately 6 inches wide and 12 feet long. The concrete on the floor of the channel is also slightly spalled.

The spillway and central outlet both discharge into a 7 by 7.5 foot box culvert under Main Street. The culvert is constructed of concrete and stone masonry, and appears to be in good condition. A 12-inch cast-iron pipe crosses the culvert along the centerline of the roadway, 3 to 4 feet above the invert. This pipe could trap debris and obstruct the flow from the pond.

d. Reservoir Area. The area around Longwater Pond is lightly developed with approximately 10 residences. It is possible that more development could occur in the future. The area is wood and grassland and has moderate slopes of 1 to 10 percent.

e. Downstream Channel. Discharge from the box culvert enters Queset Brook. The brook is about 20 feet wide, and flows in an open pasture bounded by woods. The streambed is naturally paved with boulders. There are a few trees growing on the banks.

Water flows downstream at a gradient of about 1 percent. Approximately 1 mile downstream Queset Brook flows into Morse Pond.

3.2 Evaluation. The above findings indicate that the dam is in fair condition, and there are deficiencies which require attention. Recommended measures to improve the condition of the dam are stated in Section 7.3

SECTION 4

OPERATING PROCEDURES

4.1 Procedures. Under normal operating conditions water discharges from Longwater Pond over the stoplogs in the central outlet. There are no other low level outlets for this pond. It is reported that periodic visits are made to the dam by Mr. Ames and personnel from the Town of North Easton Engineering Department.

4.2 Maintenance of Dam. The dam is not adequately maintained. The seepage in the side channel spillway was also noted in an inspection report dated 1973. The concrete in the sidewalls of the central outlet is eroded and needs repair. Riprap should be placed on the upstream slope of the dam embankment. The settlement and cracking in the traveled lanes of the asphalt-paved crest needs repair.

The mound of fill on the left embankment is subject to erosion if not properly compacted.

4.3 Maintenance of Operating Facilities. The operating facilities on this dam consist of the two sets of stoplogs within the central outlet. At the time of the inspection (December 8, 1978) the stoplogs were not in place. At a second visit on January 29, 1979 it was noted that the stoplogs had been replaced, and the water level in the pond was higher.

4.4 Description of Any Warning Systems in Effect. There is no warning system in effect at this dam.

4.5 Evaluation. There is no regular program of maintenance or warning system in effect at Longwater Pond Dam. A program of inspection and maintenance and a surveillance system for this dam should be implemented as recommended in Section 7.3.

SECTION 5

HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. General. The drainage area to Longwater Pond includes Shovelshop, Flyaway, Bigney, Monte, French, Ames, and Long Ponds, as well as several smaller ponds and swamps. The area is fairly well developed and moderately wooded. Discharge from Longwater Pond enters a box culvert under Main Street, either through a central outlet or the side channel spillway. Stoplogs on the outlet presently retain the water level in the pond at approximately El 114.7. Flow over the concrete crest of the weir commences at El 115.4. There is no other low-level outlet at the pond.

b. Design Data. There are no hydraulic computations available for this dam.

c. Experience Data. Detailed hydraulic records are not available for this dam. However, the Owners have stated that the dam was overtopped in 1968 when the dam at Flyaway Pond failed.

d. Visual Observations. The inlet to the central outlet works is divided into two bays by a central concrete wall. The effective length of each bay is 3 feet. Both the side channel spillway and the central outlet discharge into the box culvert under Main Street. During any large flood, the main constriction to flow is likely to be the inlet to the box culvert, rather than the capacity of the central outlet and spillway. Without the narrow culvert the outlets could discharge up to one-half the probable maximum flood with only minor overtopping of the crest.

During the test flood, flow over the crest of the road would be partly contained by the stone

wall on the downstream side of the road. Discharge would be confined to the area of the pipe rail over the downstream headwall of the culvert.

e. Test Flood Analysis. Longwater Pond Dam has been classified as a small size dam of low hazard potential according to the Corps of Engineers Guidelines. For this preliminary investigation a 100-year frequency flood was used. For this report this rate was considered to be equivalent to one-quarter the probable maximum flood (PMF).

The PMF rate was determined to be 900 cfs per square mile. This calculation is based on the average slope of the drainage area of 1.3 percent, the pond-plus-swamp area to drainage area ratio of 10.8 percent, and the U.S. Army Corps of Engineers' Guide curves for PMF peak flow rates (dated December 1977). Applying one-fourth the PMF to the 8.5 square miles of drainage area results in a calculated peak flood flow of 1,900 cfs as the inflow test flood. By adjusting the inflow test flood for surcharge storage, the maximum discharge rate was established as 1,790 cfs at pond El 122.2, which is 3.7 feet above the low point on the crest of the dam.

Hydraulic analyses indicate that the central outlet with stoplogs to El 114.0 could discharge 900 cfs when the water surface is at El 118.5, which is the low point on the crest of the dam. This discharge is 50 percent of the outflow test flood of 1,790 cfs. Using the outflow test flood, the pond level would be 3.7 feet above the low point on the crest.

f. Dam Failure Analysis. Based on the possible failure of the mid section of the dam embankment, the peak discharge rate would increase from 900 cfs to 3,500 cfs and produce a total flood wave downstream depth of 11 feet in the stream channel. About 2,200 feet downstream of the dam, the failure flow would discharge into the surrounding swamps and eventually into Morse Pond.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. The evaluation of the structural stability of Longwater Pond Dam is based on the visual inspection conducted on December 8, 1978. As discussed in Section 3, Visual Inspection, the dam is in fair condition. Based on the observations noted in Section 3, further investigations to evaluate the stability of the embankment are not required at this time. However, the upstream face of the dam, in the area of uncompacted fill, should be inspected periodically as this area has a high potential for erosion.

b. Design and Construction Data. There are no plans, specifications or computations available on the design, construction, or repair of this dam from the Owner, county or State.

c. Operating Records. There is no instrumentation of any type in Longwater Pond Dam, and no instrumentation was ever installed in this dam. The performance of this dam under prior loading can only be inferred by physical evidence at the site.

d. Post-Construction Changes. There are no as-built drawings available for Longwater Pond Dam.

e. Seismic Stability. The dam is located in Seismic Zone 2 and in accordance with recommended Phase I guidelines does not warrant seismic analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. Based upon a review of available drawings, the visual inspection of tne site and limited operational or maintenance information, there are deficiencies which must be corrected to assure the continued performance of this dam. Generally, the dam is considered to be in fair condition. However, several signs of distress were observed at the site: absence of riprap on the upstream slope of the dam, at the base of the concrete wall; uncompacted fill adjacent to the left abutment of the outlet; scour and erosion on the side and center walls of the central outlet; seepage through the crest of the side channel spillway; and surface cracks and depressions in the traveled lanes of the asphalt-paved crest of the dam.

Hydraulic analyses indicate that the spillway can discharge a flow of 900 cfs with the water surface at El 118.5, which is the low point on the crest of the dam. An outflow test flood of 1,790 cfs (one-quarter PMF) will overtop the dam by 3.7 feet.

With the stoplogs at El 114.0, the spillway can discharge 50 percent of the outflow test flood before overtopping the dam.

b. Adequacy. The lack of detailed design and construction data did not allow for a definitive review. Therefore, the evaluation of this dam is based primarily on the visual inspection, past performance and engineering judgment. The available data is considered adequate for a Phase I investigation.

c. Urgency. The recommendations and remedial measures outlined below should be implemented by the Owner within 1 year after receipt of this Phase I Inspection Report.

d. Need for Additional Investigation. Additional investigations to further assess the adequacy of the dam are outlined below in Section 7.2. Recommendatins.

7.2 Recommendations. The dam is in the "low" hazard category, in fair condition, and as such does not warrant additional investigation at this time. However, it is recommended that the Owner implement the repair and maintenance procedures outlined below in Section 7.3, Remedial Measures.

7.3 Remedial Measures

a. Operating and Maintenance Procedures. The dam and appurtenance structures are not adequately maintained. It is recommended that the Owner accomplish the following:

(1) Place riprap on the upstream slope of the embankment.

(2) Compact the earthfill placed adjacent to the central outlet.

(3) Repair the leak through the crest of the side channel spillway, adjacent to the outlet.

(4) Repair the scoured and eroded concrete in the side and center walls of the central outlet. Repair the spalled concrete.

(5) Repair the paved surface of the crest of the dam.

(6) Implement a systematic program of maintenance inspections. As a minimum, the inspection program should consist of a bi-annual inspection of the dam and appurtenances, supplemented by additional inspections during and after severe storms. All repairs and maintenance should be undertaken in accordance with all applicable State regulations.

(7) Periodic technical inspections of this dam should be continued on a biennial basis.

7.4 Alternatives. There are no recommended alternatives to the remedial measures listed above.

APPENDIX A

PERIODIC INSPECTION CHECKLIST

LONGWATER POND DAM

PERIODIC INSPECTION

PARTY ORGANIZATION

PROJECT LONGWATER POND DAM

DATE 8 DEC. 1978

TIME 1:30 PM

WEATHER Overcast, Rainy

W.S. ELEV. 109.6 U.S 109.3 DN.S.

PARTY:

1. W. Checchi
2. D. Cole
3. E. Greco
4. G. Komisarek
5. H. Lord
6.
7.
8.
9.
10.

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Dam Embankment	Greco/Komisarek	
2.	Spillway/Outlet	Greco/Komisarek	
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECK LIST

PROJECT LONGWATER POND DAM DATE 8 DEC. 1978

PROJECT FEATURE Dam Embankment NAME Greco

DISCIPLINE Geotechnical NAME Komisarek

U.S. = upstream D.S. = Downstream

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	None visible-except in pavement traveled way.
Pavement Condition	Main St.integral part of dam. Some diff. dipping. Asphalt overlayed.
Movement or Settlement of Crest	None visible
Lateral Movement	None visible
Vertical Alignment	Relatively flat
Horizontal Alignment	Relatively straight
Condition at Abutment and at Concrete Structures	Fair to good, spillway abut eroded on rt.U.S.side,left U.S.side covered with new dumped fill.
Indications of Movement of Structural Items on Slopes	None visible although repairs made to Main St. box culvert at end of side channel spillway
Trespassing on Slopes	New fill placed on left U.S. slope
Sloughing or Erosion of Slopes or Abutments	New fill on left embank shows erosion
Rock Slope Protection - Riprap Failures	No riprap present
Unusual Movement or Cracking at or near Toes	None-new fill placed on left U.S. slope
Unusual Embankment or Downstream Seepage	None visible-water discharging thru sluiceway without stop logs
Piping or Boils	None visible
Foundation Drainage Features	None
Toe Drains	None visible
Instrumentation System	None

PERIODIC INSPECTION CHECK LIST

PROJECT LONGWATER POND DAM DATE DEC. 8 1978

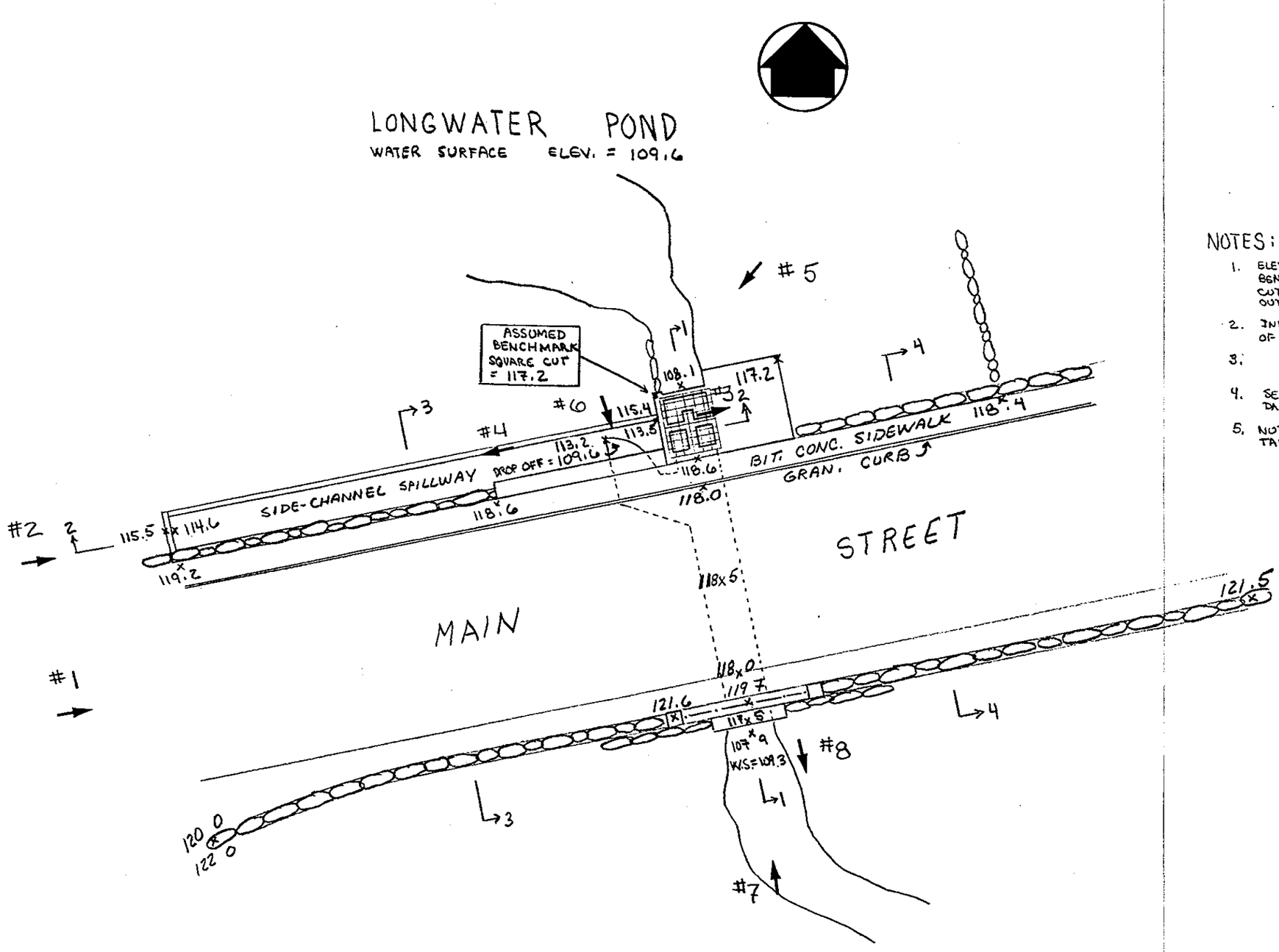
PROJECT FEATURE Spillway/sluiceway NAME Greco

DISCIPLINE Geotechnical NAME Komisarek

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Changed by addition of fill and RCP culvert-fair to good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Flat, sloping with sandy fill in channel bottom
b. Weir and Training Walls	
General Condition of Concrete	Poor to bad. Badly scoured below high water. Side channel spillway fair to good.
Rust or Staining	Weir rust stained-some algae
Spalling	Weir/sluiceway extensive. Spillway spalled in general
Any Visible Reinforcing	None
Any Seepage or Efflorescence	None
Drain Holes	None
c. Discharge Channel	Discharge directly into box culvert under main street
General Condition	Rubble-mortar - fair to good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	Some small trees on left side D.S. of box culvert
Floor of Channel	Good in box culvert which discharges into natural streamChan1
Other Obstructions	12"C.I.pipe in box culvert at mid hgt.D.S. end of box

APPENDIX B

PLANS OF DAM AND PREVIOUS INSPECTION REPORTS

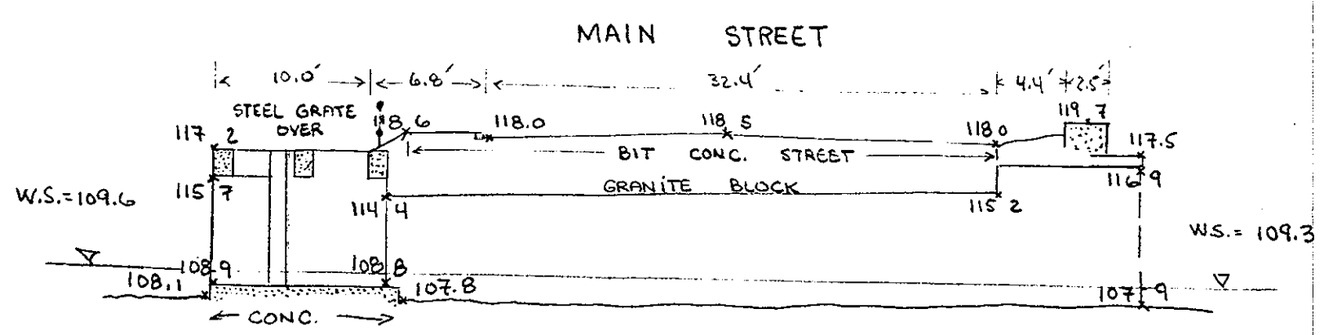


NOTES:

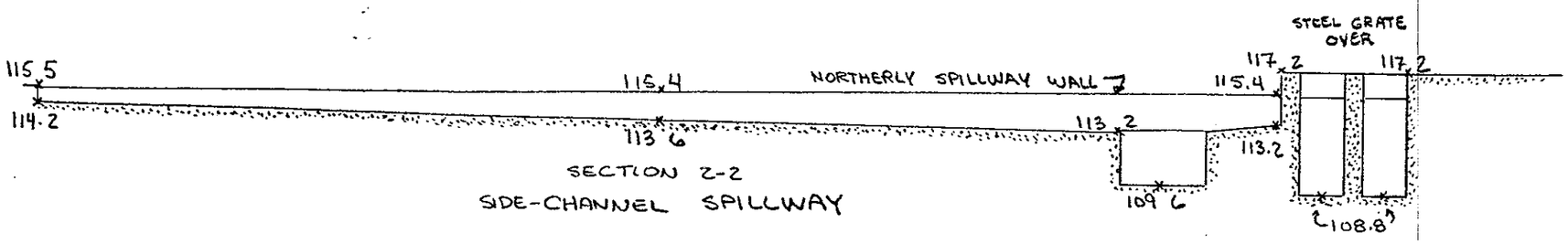
1. ELEVATIONS SHOWN ARE REFERENCED TO ASSUMED BENCHMARK ELEV. 117.2 (MSL) ON SQUARE CUT ON NORTHWESTERLY CORNER OF OUTLET SIDEWALL
2. INFORMATION SHOWN BASED OF FIELD SURVEY OF DECEMBER 8, 1978
3. #2 INDICATES LOCATION AND DIRECTION OF VIEW FOR PHOTOGRAPHS
4. SEE FIGURE B-2 FOR SECTIONS THROUGH DAM
5. NOTE THAT PHOTOGRAPHS SHOWN WERE TAKEN 29 JANUARY 1979.

METCALF & EDDY, INC.

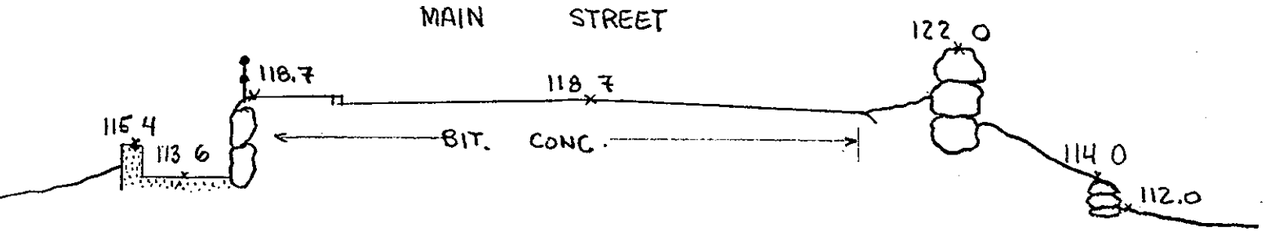
METCALF & EDDY, INC. ENGINEERS BOSTON, MA.	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MA.
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	
LONGWATER POND DAM	
FIGURE B-1 PLAN OF DAM	
TRIBUTARY TAUNTON RIVER	MASSACHUSETTS
SCALE: 1" = 20'	DATE: MARCH, 1979



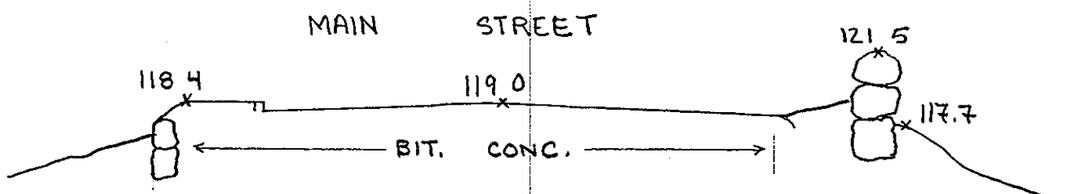
SECTION 1-1
CHANNEL



SECTION 2-2
SIDE-CHANNEL SPILLWAY



SECTION 3-3



SECTION 4-4

METCALF & EDDY, INC.

METCALF & EDDY, INC. ENGINEERS BOSTON, MA.	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MA.
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	
LONGWATER POND DAM	
FIGURE B-2 SECTIONS THROUGH DAM	
TRIBUTARY TAUNTON RIVER	MASSACHUSETTS
SCALE: 1" = 10'	DATE: MARCH, 1979

DESCRIPTION OF DAM

DISTRICT 6

Submitted by A. H. LOUNSBURY

Dam No. 6-3-88-4

Date NOV. 21, 1973.

City/Town EASTON

Name of Dam LONGWATER POND

Location; TOpo Sheet No. 32D

Provide 8½" x 11" in clear copy of topo map with location of Dam clearly indicated.

Year built: UNK (Prior to 1955) Year/s of subsequent repairs UNK.

Purpose of Dam: Water Supply ____ Recreational ✓

Irrigation ____ Other ____

Drainage Area: 3.1 sq.mi. 1980 acres.

Normal Ponding Area: 6.4 Acres ; Ave Depth 4'

Impoundment 8.34 Mil. gals; 26 acre ft.

No. and type of dwellings located adjacent to pond or reservoir 2

e.g. summer homes etc. ____

Dimensions of Dam: Length 140 . Max. Height 8 .

Slopes: Upstream Face VERTICAL

Downstream Face VERTICAL

Width across top 36' .

Classification of Dam by Material:

Earth ✓ . Conc. Masonry ____ . Stone Masonry ____

Timber ____ . Rockfill ____ . Other ____

A. Description of present land usage downstream of dam: 90 % rural; 10 % urban.

B. Is there a storage area or flood plain downstream of dam which could accommodate the impoundment in the event of a complete dam failure YES ✓ . NO. ____ .

(OPEN PASTURE)

DAM NO. 6-3-88-4

to life and property in event of complete failure.

No. of people NONE

No. of homes

No. of Businesses

No. of Industries Type

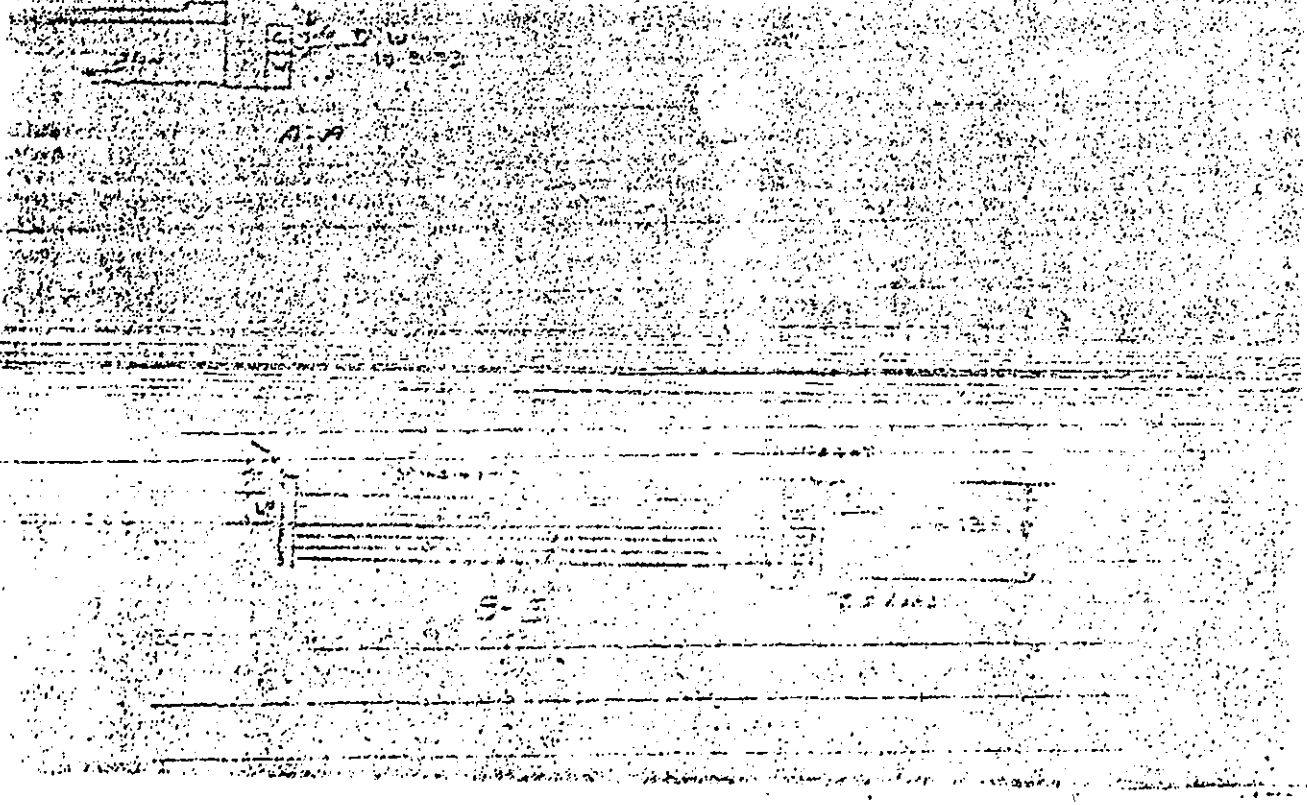
No. of Utilities Type

Railroads

Other Dams

Other MAINT ST

1. Attach Sketch of dam to this form showing section and plan on 8½" x 11" sheet.



INSPECTION REPORT - DAMS AND RESERVOIRS

Location: ~~City~~/Town EASTON. Dam No. 6-3-88-4

Name of Dam LONGWATER POND INSPECTED BY: A.H. LOUNSBURY.

Date of Inspection Nov. 8, 1973.

2. Owner/s: Per: Assessors ✓. Prev Inspection ____.

Reg. of Deeds ____. Pers. Contract ____.

1. DAVID AMES OLIVER ST. NO. EASTON MASS.

Name St. & No. City/Town State Tel No.

2. ____

Name St. & No. City/Town State Tel No.

3. ____

Name St. & No. City/Town State Tel No.

3. Caretaker(if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

TOWN OF EASTON TOWN HALL EASTON MASS 828-3551

Name St. & No. City/Town State Tel. No.

4. No. of pictures taken ____.

5. Degree of Hazard: (If dam should fail completely)*

1. Minor ✓. 2. Moderate ____.

3. Severe ____. 4. Disastrous ____.

*This rating may change as land use changes (Future development)

6. Outlet Control: Automatic ____. Manual ✓.

Operative ✓ yes; ____ No.

Comments: ____

7. Upstream Face of Dam: Condition*

1. Good ✓. 2. Minor Repairs ____.

3. Major Repairs ____. 4. Urgent Repairs ____.

Comments: ____

DAM NO. C-3-88-4

Downstream Face of Dam: Condition: 1. Good ✓. 2. Minor Repairs ✓.
3. Major Repairs ____. 4. Urgent Repairs ____.
Comments: ____

9. Emergency Spillway: Condition: 1. Good ____. 2. Minor Repairs ✓.
3. Major Repairs ____. 4. Urgent Repairs ____.
Comments: SPILLWAY IS LEAKING AT JOINT OF WOOD & CONCRETE WITH MINOR CONCRETE DETERIORATION

10. Water level @ time of inspection: 0.6 ft. above ____. below ✓.
top of dam ____. principal spillway ✓.
other ____.

11. Summary of Deficiencies Noted:
Growth (trees and bruch) on Embankment NONE.
Animal Burrows and Washouts "
Damage to slopes or top of dam "
Cracked or Damaged Masonry MINOR.
Evidence of Seepage NONE.
Evidence of Piping ____.
Erosion "
Leaks SPILLWAY AS NOTED.
Trash and/or debris impeding flow NONE.
Clogged or blocked spillway NONE.
Other ____.

BRISTOL COUNTY, MASS.
INSPECTION REPORT & DATA FOR DAMS

DAM NO. 6-3-66-4

Remarks & Recommendations: (Fully Explain)

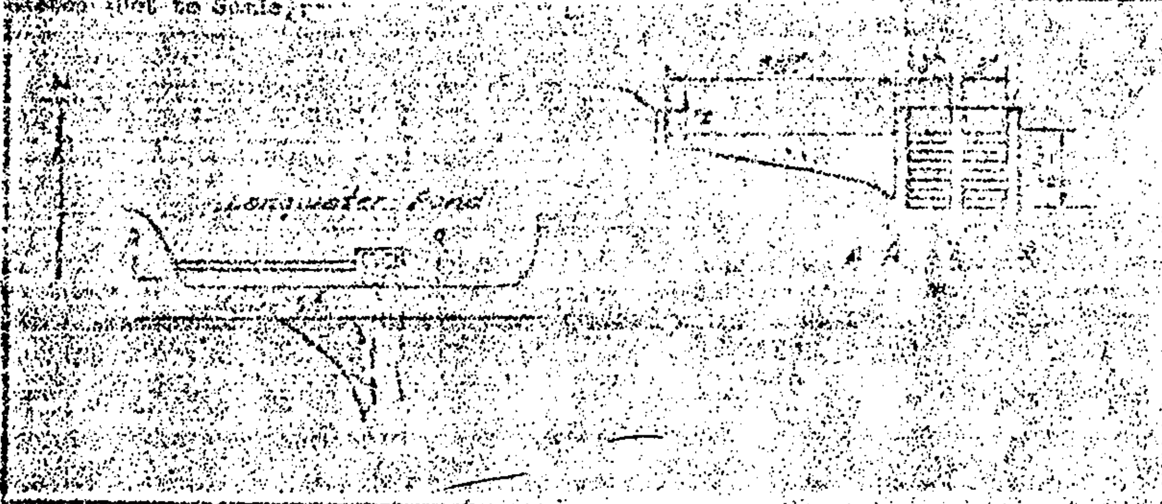
PREVIOUS HISTORY OF COUNTY RECORDS REVEAL NEARLY OVERTOPPED IN 1955 AND TOPPED IN 1968 CAUSING EROSION AROUND HOUSE ACROSS THE STREET.

REPAIR LEAK IN SPILLWAY & CONCRETE DETERIORATION

DETERMINE ADEQUACY OF DISCHARGE PROVISIONS.

General Description of Dam and Discharge Control: Concrete spillway and manually ... stoplogs in center sluice. Below Main Street ... no ...

Sketch (Not to Scale):



Remarks and Recommendations: Discharge provisions low ... upstream ...
Recommend increased discharge provisions. Nearly overtopped 1955.

13. **Overall Condition:**

1. Safe ✓
2. Minor repairs needed ✓
3. Conditionally safe-major repairs needed ______.
4. Unsafe ______.
5. Reservoir impoundment no longer exists(explain)

Recommend removal from inspection list. ______.

BRISTOL COUNTY, MASS.
INSPECTION REPORT FOR DAMS

PREPARED FOR THE BRISTOL COUNTY COMMISSIONERS
BY UNIVERSAL ENGINEERING CORP., BOSTON, MASS.

DAM NO. Ea-4
TOWN: Easton

INSPECTION DATE	REMARKS & RECOMMENDATIONS
3-12-70	Stop logs arein. Water is passing through stop log slots. Water flowing over spillway. Some minor flanking on westerly side.

Supplement to original report and data by Hayden, Harding & Buchanan, Inc.

DAM NO. Ea-4

Ea-4

BRISTOL COUNTY, MASS.
DATA SHEET & INSPECTION FORM FOR DAMS

Town Easton

Dam No. 4

Stream Whitman Brook and Quosset Brook (Ames Pond, Long Water Pond)

Date of Inspection 1/13/59

Inspected By JHR

Organization Haydan, Harding & Buchanan, Inc.

Location: USGS Quad Brockton Lat 42° 04'-00" Long 71° 05'-40"

Reference: North Main Street, east of North Easton

Owner of Dam Highway Dept. operates / Town Shovel Function of Dam Formerly Power, Now Rec.

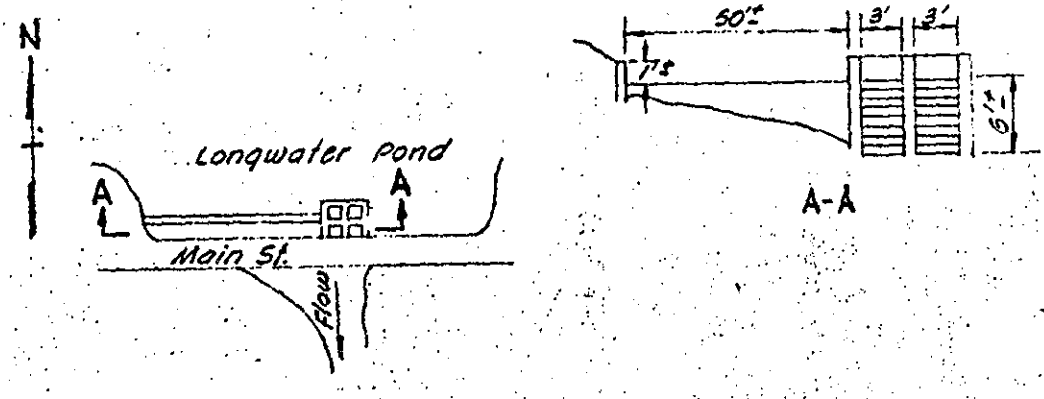
Drainage Area _____ Character of D.A. _____

Flood of Record (date) 1955 Discharge (or high water el) _____

General Description of Dam and Discharge Control: Concrete spillway and manually withdrawn stoplogs in center sluice. Below Main Street open pasturage; no homes.

Estimated Discharge Capacity: Neglect spillway, too little freeboard thru flume, 4' head, 8 fps Q = 8 x 4.6 = 192 cfs

Sketch:



No Scale

Remarks and Recommendations: Discharge provisions lower than upstream dam. Recommend increased discharge provisions ~~many overtopped in 1955.~~

General Condition	
Good	
Fair	X
Poor	

LONGWATER POND DAM

APPENDIX C

PHOTOGRAPHS

LONGWATER POND DAM

NO. 1 WEST–EAST VIEW OF DAM CREST (MAIN STREET)

NO. 2 UPSTREAM VIEW – SIDE CHANNEL SPILLWAY-OUTLET WORKS

NO. 3 UPSTREAM VIEW – LEFT ABUTMENT

NO. 4 UPSTREAM VIEW – RIGHT ABUTMENT

NO. 5 VIEW OF OUTLET WORKS

NO. 6 VIEW OF SIDE CHANNEL SPILLWAY OUTLET

NO. 7 VIEW OF OUTLET WORKS – DOWNSTREAM

NO. 8 VIEW OF DOWNSTREAM DISCHARGE CHANNEL

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

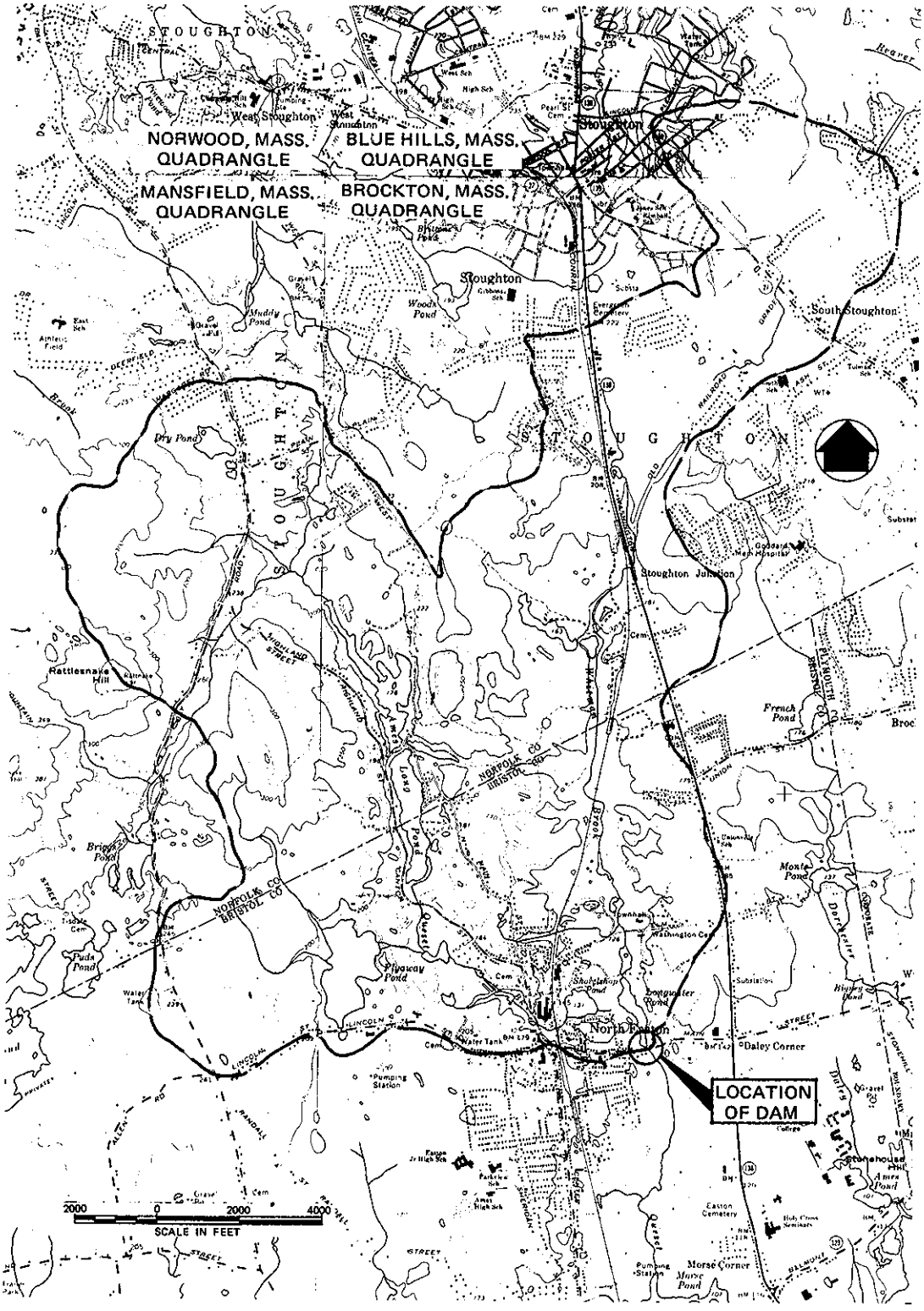


FIG. D-1 DRAINAGE AREA MAP – LONGWATER POND

Project Nat. Review of Non Fed. Dams Acct. No. 6191 Page 1 of 5
Subject Bristol County, Mass. Comptd. By LEB Date 1/9/79
Detail LONGWATER POND Ck'd. By BK Date

(I) Test Flood, Storage & Storage Functions

1- Total Drainage Area - 8.50 mi²

2- Pond(s) Area: .022+.015+.095+.149+.023+.013+.017 = 0.334 mi²
Swamp(s) Area: .026+.065+.029+.03+.014+.039+.082+.014+.079+.21 = 0.588 "
Total Area Pond(s) & Swamp(s): 0.922 "

% Ponds & Swamps = $\frac{0.922}{8.50}$ = 10.8%

3- $\frac{275-110}{18800}$ = 0.88% ; $\frac{400-110}{14600}$ = 1.99% } Say Ave Slope = 1.3%
$\frac{340-110}{23000}$ = 1.00%

4- Using C. of E. Curves for Peak Flow Rates & above guide values the Peak Flow Rate was estimated to be a little higher than "Flat & Coastal" and taken at 900 c.f.s./mi²
Size Class: Small ; Hazard Pot.: Low ; Spill. Des. Flood: 50yr to 100 yr
Use: Test Flood = 100 yr.; Assume 100 yr ≃ ½ PMF

5- Test Flood Inflow = ½ (900) 8.5 = 1900 c.f.s.

6- Pond Storage
The pond area is 0.022 sq. mi. at elev. 114. Based on a const. area, storage increases at 13.8 ac. feet per foot of depth increase.

7- Spillway crest elev. is estimated at 114 - when stoplogs in.

8- Storage Functions are based on $Q_{out} = Q_{in}\left[1 - \frac{S_{out}}{R}\right]$
Sout = Storage Vol. in Reservoir related to final Qout in terms of inches of rain over the drainage area.
S(in Inches) = 12 D $\left(\frac{.022}{8.5}\right)$ = 0.031 D ; R = 6hr rain of storm.
D = Storage depth in feet above spillway crest in reservoir

9- Storage Functions: (Test Flood & ½ PMF - if needed)

F_{TF} = 1900 - 400 S = 1900 - 12.4 D	
$F_{½PMF}$ = 3800 - 400 S = 3800 - 12.4 D	

(II) Discharge Ratings

A - Main Spillway

Pond has been drawn down. Assume stoplogs w/crest at 114.0 in main spillway to produce normal pond.
Stoplogs - 2 sets, each 3' wide; Use "Hydr. Tables" - Williams & Hazen; p = 30'

Pond El.	115	116	117	118	119	120	121	122
q	3.33	9.32	17.1	26.35	36.88	48.67	60.46	72.25
Q_M	20	60	100	160	220	290	360	430

B - Side Spillway

Side spillway = 85' long - crest el. 115.4± - use Hydr. Tables - p = 30

Pond El.	116	117	118	119	120	121	122
q	1.57	6.69	13.8	22.48	32.53	43.83	55.87
Q_S	130	570	1170	1910	2760	3720	4750

C - Crest Flow at Gap in Wall

"Dam" crest is paved Main St followed by stone wall
Opening in stone wall is 22' wide w/crest elev. @ 119.7
Use Hydr. Tables w/p = 30 & reduction factor of 0.95

Pond El.	120	121	122	123	124
Adj. q	.55	4.46	10.9	18.7	27.9
Q_T	10	100	240	410	610

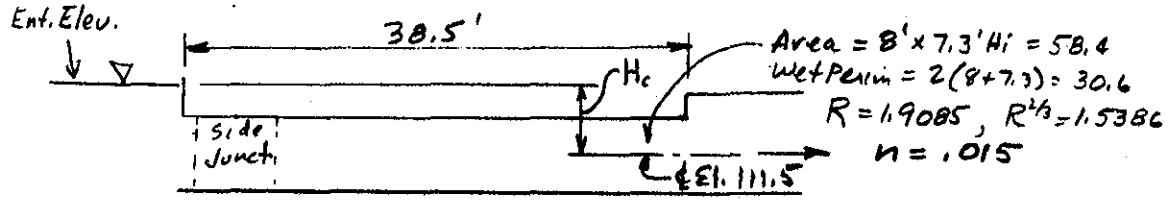
D - Low Level Outlet

Pond El. 114 - Remove 1' of stoplogs in Main Spillway
Disch. varies from 20 cfs to 0 cfs

Time to drain 1' = $\frac{13.8(43560)}{3600(20)\frac{1}{2}} = 16.7$ Hours

(II) Discharge Ratings - Cont.

E - Culvert Capacity



H_c = Ent Loss + Exit Loss + Junction Loss + Friction

$H_c = 0.5\,h_v + 1.0\,h_v + 0.3\,h_v + 2g(L)\left[\frac{n}{1.49R^{2/3}}\right]^2 h_v$

$H_c = 1.8\,h_v + .106\,h_v = 1.906\frac{V^2}{2g}$; $Q_c = A\left[\frac{2gH_c}{1.906}\right]^{1/2} = 339.5\,H_c^{1/2}$

Ent. Eleu.	115	116	117	118	119	120	121	122	123	124
H_c	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5
Q_c	630	720	800	870	930	990	1050	1100	1150	1200

F - Crest Flow over Wall

Length: ±180', Eleu. 121.5±, Calc. as in (C) above; $p = 12'$

Pond El.	122	123	124	125
Adj q	1.15	5.91	12.52	20.9
Q_F	210	1050	2250	3760

(III) Over Crest Flow

A - "Gap" Flow

$122.2 - 119.7 = 2.5'$, $q_A = 13.01\,(.95) = 12.4$ cfs/ft.

As Critical Flow: $y_c = 1.68'$, $V_c = 7.4$ fps

B - Wall Crest Flow

$122.2 - 121.5 = 0.7'$, $q_B = 1.97\,(.95) = 1.87$ cfs/ft.

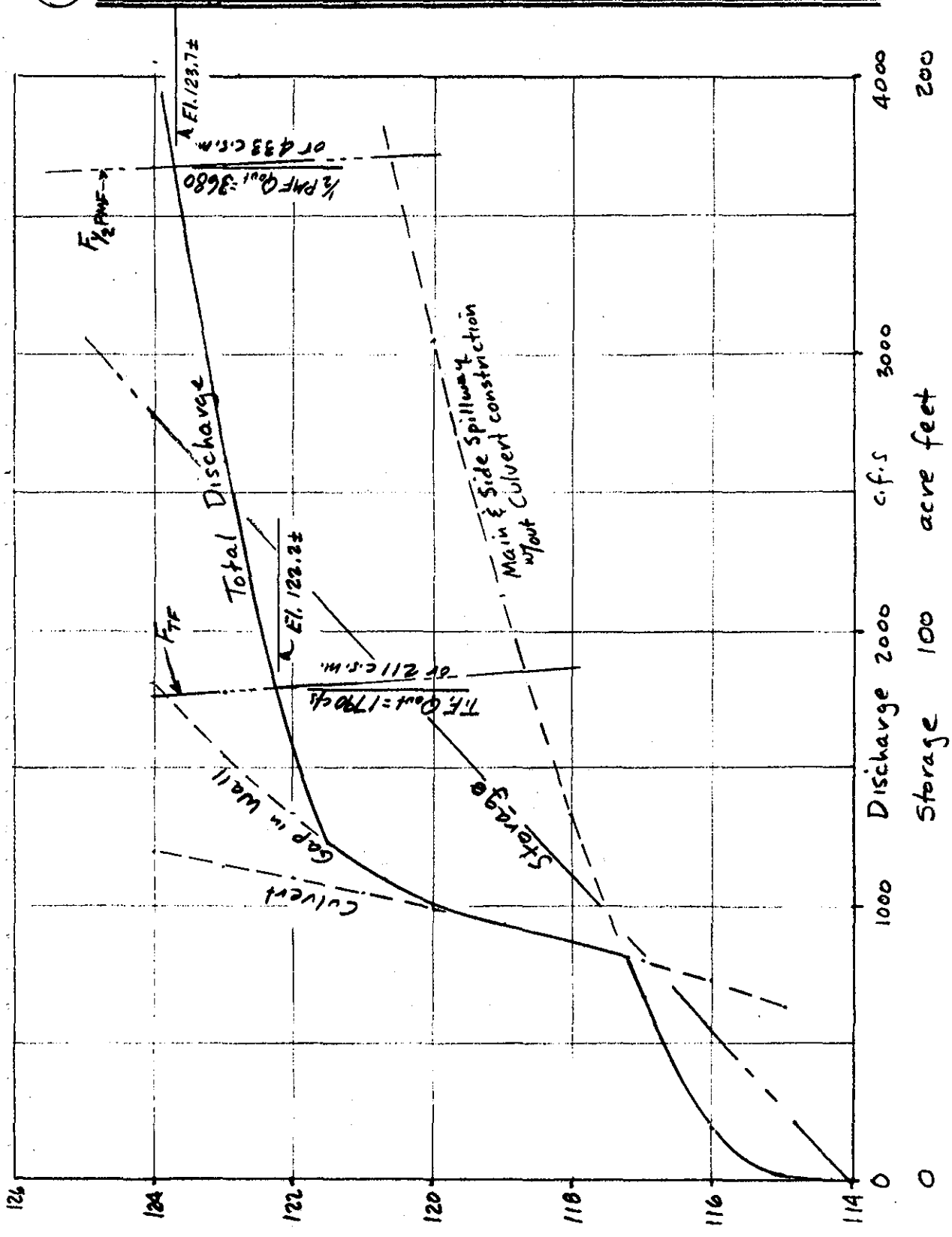
As Critical Flow: $y_c = 0.48'$, $V_c = 3.9$ fps.

Project Nat. Review of Non Fed. Dams Acct. No. 6191 Page 4 of 5

Subject Bristol County, Mass. Comptd. By LEB Date 1/9/79

Detail LONGWATER POND Ck'd. By GK Date

(IV) Discharge, Storage & Storage Function vs. Pond Elev.



(V) Failure of Dam

Peak Failure Flow:

Pond Elevation - 118.5
Toe Elevation — 107.9
Y_o = 10.6'

Dam Length Subject to Breaching = 110 ft.

$W_o = 40\%(110) = 44$ ft.

$$Q_{P_1} = 1.68\, W_o (Y_o)^{1.5} = 1.68(44')(10.6)^{1.5} = 2600$$

Spillway disch at pond elev. 118.5 = 900 cfs ∴ Total Failure Q = 3500 cfs

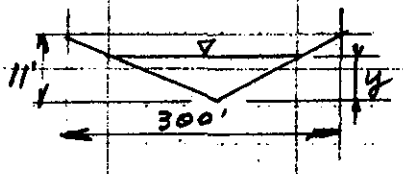
Storage Volume Released:

Storage Above Spillway	13.8(4.5) =	62	ac. ft.
Storage Below Spillway	13.8(6) 1/3 =	28	" "
S = Total Storage =		90	" "

Channel Hydraulics:

$S = \frac{2\pm}{2200} = .0009$, $n = .07$, $R \approx \frac{1}{2}y$, $A = 13.64\, y^2$

$V = .6918\, R^{2/3} = .404\, y^{2/3}$



y	A	V	Q
2'	54	0.64	30
4'	218	1.02	220
6'	491	1.33	650
8'	873	1.62	1410
10'	1365	1.88	2560
12'	1964	2.12	4160
11'	1650	2.00	3300

Total "Failure Flow" produces depth of ±11'
Initial spillway flow " " " ±7'
Failure cause 4' wave for ±2200' of narrow channel, before spreading in swamps and ponds
High tailwater would reduce theoretical failure flow, above.

Channel sect. is ±1200 ft dnstr of dam, ∴ no channel storage.
±2200 ft dnstr of dam is start of swamps leading to Morse Pond.
Taking 45 ac. of Morse Pd @ el. 107 (U.S.G.S.) & 96 ac. of swamps at el. 108, then 90 ac ft from Longwater raises pool at Morses Pd by ± 1.3 ft

Time to Drain:

$$\frac{43560\,(90)}{3600\,(\frac{1}{2})\,(2600)} = 0.84 \text{ Hours, or } 50 \text{ Minutes}$$

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

LONGWATER POND DAM